

## ABSTRACT

- To investigate the capabilities of communication bridging applications/software as tools to support spoken communication, we asked 26 deaf and hard-of-hearing college students to use a variety of Automatic Speech Recognition (ASR) applications and software in real-world (field) settings and to provide evaluative feedback. Our aim was to assess how well these technologies could facilitate: 1) student-to-student classroom communication, 2) informal conversations, 3) job interviews, and 4) speech production practice.

## PARTICIPANTS

### 26 NTID Students:

- 15 students enrolled in *Organizational Communication and the Deaf Employee (Fall, 2013)*
  - 4 freshmen
  - 8 second and third year students
  - 3 fourth year students
- 11 students enrolled in *Organizational Communication and the Deaf Employee (Spring, 2015)*
  - 3 freshmen
  - 8 second and third year students

## ASR APPS TRIALED

### Speech-to-Text/ Automatic Speech Recognition (ASR)

iOS	ANDROID
Siri	Google Now
Google Translate <i>Free</i>	Google Translate <i>Free</i>
Dragon Dictation <i>Free</i>	Virtual Voice <i>Free</i>
	DEAFCOM <i>Free</i>

## ASR RESULTS

- Ratings clustered in the mid-range on a 5 point rating scale.
- During follow-up interviews, study participants:
  - Provided a vote of confidence and a message of appreciation to software developers in their ratings
  - Indicated that the technology put hearing people at ease
  - Reported disappointing performance when encountering:
    - Noise in the environment
    - Talkers with accented speech
    - Excessive lag time in displaying a talker's speech

## ADDITIONAL COMMUNICATION BRIDGING APPS SHARED

### Speech-to-Text/ASR

iOS	ANDROID	WINDOWS
Siri	Google Now	Cortana
iSpeech Dictation <i>Free</i>	Swype Keyboard (uses Dragon) <i>Free trial/\$0.99</i>	Dragon Notes <i>Free trial / \$19.99 (Win 8 tablet/PC)</i>
Flip Writer AAC <i>Free/\$24.99 (iPad)</i>	Google Keep <i>Free</i>	VoiceTranslator <i>Free</i>
	ListNote Speech-to-Text Notes <i>Free</i>	SpeechTrans for Hearing Impaired <i>Free (Win 8 PC)</i>

### Text-to-Speech (TTS)

iOS	ANDROID	WINDOWS
iSpeech – Text to Speech <i>Free / \$2.99-\$7.99</i>	Say It To Me <i>Free</i>	Talk2me <i>Free</i>
NaturalReader Text to Speech <i>Free</i>	Virtual Voice <i>Free</i>	Text to Speech <i>Free</i>
Spell Better <i>Free (iPad)</i>		VoiceTranslator <i>Free</i>
Flip Writer AAC <i>Free/\$24.99 (iPad)</i>		SpeechTrans For Hearing Impaired <i>Free (Win 8 PC)</i>

### Pronunciation Practice

iOS	ANDROID	WINDOWS
Dictionary.com <i>Free</i>	Dictionary.com <i>Free</i>	Dictionary.com <i>Free</i>
Dragon Dictation <i>Free</i>	DEAFCOM <i>Free</i>	Dictionary <i>Free</i>
iSpeech Dictation <i>Free</i>	Virtual Voice <i>Free</i>	VoiceTranslator <i>Free</i>
Flip Writer AAC <i>Free/\$24.99 (iPad)</i>		GrammarFone <i>Free (PC)</i>
		Dragon Notes <i>Free trial / \$19.99 (Win 8 tablet/PC)</i>

### Text

iOS	ANDROID	WINDOWS
Chalk Draw <i>Free</i>	Bord <i>Free</i>	Chalkboard <i>Free</i>
Speller <i>Free</i>	Blurb <i>Free</i>	
Sorenson BuzzCards <i>Free</i>	Spell Checker +voice input <i>Free</i>	
Flip Writer AAC <i>Free/\$24.99 (iPad)</i>	Grammar & Spelling Keyboard <i>Free</i>	
Glide – Live Video Messaging, Chat & Text <i>Free</i>	Glide – Live Video Messaging <i>Free</i>	

### Grammar

iOS	ANDROID	WINDOWS
SpellCheckPlus Mobile \$5.99	SpellCheckPlus Mobile \$5.99	GrammarFone <i>Free (PC)</i>
Practice English Grammar <i>Free</i>	Practice English Grammar <i>Free</i>	Practice English Grammar <i>Free</i>
	Grammar & Spelling Keyboard <i>Free</i>	

### Job Interview Preparation

iOS	ANDROID	WINDOWS
Job Interview App <i>Free (first 5 ?'s) \$7.96 (full)</i>	Job Interview Question-Answer <i>Free</i>	Interview Questions & Tips <i>Free</i>
		Complete HR Interview Guide <i>Free</i>

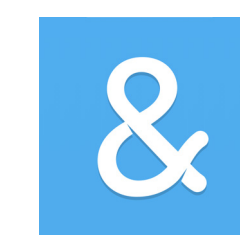
## FEEDBACK FROM STUDENTS

### Positive experiences relative to app trials:

- Apps provide visual support to conversations/dialogues.
- TTS now includes prosody features for more natural speech.
- Apps allow for spelling and grammar checks for written e-mail and letters.
- Apps permit job interview rehearsal.

### Negative experiences relative to app trials:

- Automatic Speech Recognition (ASR) makes errors in noise and with accents.
- Job interview apps are not captioned.
- Apps can be slow and decrease battery life of devices.
- The risk of viruses deters some users.



### Ava by Transcense Labs

- In development now for Android & iOS; Anticipated delivery: mid January 2016
- Aims to provide deaf/HoH user with access to spoken group conversations
- Uses voice recognition to send the user live, color-coded text of each speaker's spoken utterances
- Projected cost: \$29/month subscription
- [YouTube: Transcense](#)
- [www.ava.me](http://www.ava.me)



### MotionSavvy's UNI Software

- In development; Anticipated delivery: Summer 2016
- Sign-to-Speech translation program
- Uses Leap Motion camera to detect sign movements; Uses Nuance's Dragon ASR for Speech-to-Text translation
- Options:
  - UNI Pro \$799 + \$20/month
    - Includes Dell Windows tablet
  - UNI Basic \$99 + \$20/month
    - PC and Mac
- [YouTube: UNI](#)
- [www.motionsavvy.com](http://www.motionsavvy.com)



### InnoCaption

- Developed; Pending FCC approval as of April 2015
- Live captioning of traditional phone conversations that uses stenographers rather than ASR
- Transmits and receives voice and captioned data on user's phone
- Requires:
  - Apple or Android mobile phone
  - U.S. mobile network carrier that allows simultaneous voice and data
- Free for Deaf or HoH
- Paid for by U.S. Government's Interstate Telecommunications Relay Services (TRS) Fund
- Users must register @ website to receive downloadable app: [www.innocaption.com](http://www.innocaption.com)

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